

JULY

1948



ORGAN OF THE MUSHROOM GROWERS' ASSOCIATION

CONTENTS

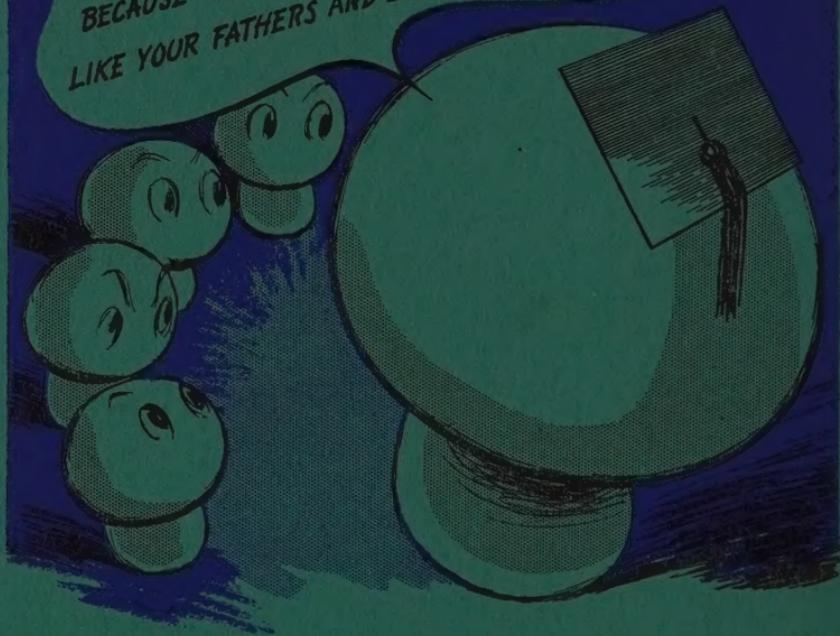
	Page
EDITORIAL	115
MUTUAL AID: Questions and Answers	116
DISEASE CAUSED BY DACTYLIUM : Fred. C. Atkins	118
IS RESEARCH UNDESIRABLE ? : Anonymous	120
SIR OLIVER LESE ON RESEARCH	121
MARKETING MUSHROOMS	122
IS RESEARCH TOO COSTLY ? : H. S. Allsop	123
ADVICE TO ADVISERS : S. Middlebrook	124
IMPORTING MUSHROOMS : Fred. C. Atkins	125
THE GRADING OF MUSHROOMS	126
THE CONTROL OF BUBBLE : Dr. E. B. Lambert	128
ROBERT PATTERSON	130
M.G.A. HONOURS SCIENTISTS	131
ITEMS OF GENERAL INTEREST	134
TECHNICAL ABSTRACTS	134
MUSHROOM ABNORMALITY : Dr. C. J. La Touche	136
DECAYED BEDBOARDS : Fred. C. Atkins	137
FROM THE M.G.A. BOOKSHELF	138
VERDI GRIS (!) IN WORTHING : Fred. C. Atkins	140
PRESS CUTTINGS	141
A MUSHROOM GROWER'S DIARY	142
"MAJOR DISEASES OF THE CULTIVATED MUSHROOM"	144
NEW MEMBERS	Inside back cover

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Illustration shows part view of a 250' Mushroom House, from which a total of six tons of mushrooms have been picked, belonging to Messrs. Church Farm Nurseries, Rustington, Sussex—an average of three pounds per square foot of mushrooms was marketed. The crop was grown entirely on Bushell's Long Straw Stable Manure

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Site contamination, whether by insect pests or disease organisms, is the greatest menace to successful mushroom production.

With the aid of E.C.A.-55 this danger can be quickly and economically eliminated, ensuring complete freedom from diseases and pests when the beds are laid. May we send you our leaflet No. 3, which deals with this subject?



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THE

JULY



1948

BULLETIN No. 12

No responsibility can be assumed by the Editor, the Editorial Board, or the Mushroom Growers' Association, for statements made or views expressed in this Bulletin, or for any advertisements included in this publication.

EDITORIAL

The mushroom grower, with one weather eye open for Government statements, has been told recently that Horticulture is to have equal priority with Agriculture for labour and materials. He has also been told that there is to be no discrimination against mushrooms in Horticulture. After years of being treated as the poor relation this is apt to go to his head, until he starts to work things out. One C.A.E.C. tells us all this is meaningless, as milk has priority over tomatoes, and tomatoes priority over all other horticultural crops. The tests applied by practical A.E.C.'s to applications to build horticultural cropping houses appear to be 'Will approval increase production?' Only if the answer in each case is 'Yes' will any consideration be given to the case. We could stop growing mushrooms and try tomatoes

Members have asked from time to time why the M.G.A. works for all mushroom growers rather than for its loyal members. I can do no better than quote an official statement recently made by the N.F.U. in reply to a similar question : "The answer is simply that the N.F.U. is, and is recognised by the Government and all practical bodies as being, the organisation representing the practical farmer as tenant and occupier. Its views as representing 182,000 farmers carry great weight and we are only too glad to accept the responsibility of representing and protecting the interests of all farmers concerned, in the hope that the small number of farmers who are still not members will recognise the value to them, as well as members, of the services provided by the Union for which members pay."

Despite the above statement, with which the Executive Committee wish to associate themselves wholeheartedly, the M.G.A. operates primarily for the benefit of its members, and if, for instance, any member experiences real difficulty in an attempt to build mushroom houses with uncontrolled or second-hand material, they should send all particulars, together with all relevant correspondence, to this office and I will do all I can to help.

Yaxley, Peterborough.

MUTUAL AID

Members Ask Your Advice

The purpose of this Mutual Aid Section is to provide an opportunity for members to seek the advice of other growers. The success of the section depends entirely upon whether members are prepared to help their fellows by sending to the Secretary their answers to these queries.

Q. 79. Can you give me any information on *Xylaria vaporaria*? I believe it is a manure fungus, but am particularly keen to know whether it can be introduced through soil.

Q. 80. What is the best layout for a mushroom house?

Q. 81. When starting to grow mushrooms, is it wiser to heat by thermostatically-controlled electric radiators at first and later change to steam heating?

Q. 82. A smooth concrete floor and plastered walls would be preferable to the wooden floor and wainscoting in the building I propose to adapt for mushrooms, presumably. But as some houses are timber, is this expense justified?

Q. 83. Is it advisable to warm water before applying to the beds?

Q. 84. Is there any accepted formula for the amount of ventilation required, or any correct ratio between bed and air space?

Q. 85. If any members have any photographs of mushrooms attacked by disease would they please send copies, or lend them, as I am proposing to publish a booklet on Mushroom Diseases and am held up for illustrations?

Q. 86. I would like your candid opinion as to the advantages of corrugated iron for "bunks" over chain link fencing.

Q. 87. I am having to pay £12 a ton for my compost; is it possible to let me have some form of estimated "receipt and expenditure" account assuming a grower has 2,000 sq. feet under cultivation—to help me to decide whether to go ahead with my plans to grow mushrooms?

Answers to Previous Questions

Q. 73. All my mushroom beds are concrete and I propose to cover the concrete with Sisal Kraft or Union Kraft paper—instead of doing this, do you recommend putting a layer (2 or 3 inches) of straw on the concrete or is this liable to cause the compost to dry up too much?

I strongly advise the paper. Straw is a potential source of diseases and pests.
FRED. C. ATKINS.

Q. 74. My new heavy watering method is producing the mushrooms, but after about $1\frac{1}{2}$ lbs. per square foot I get patches of bacterial trouble. They start, these patches, by having one or maybe two mushrooms affected. Later in the same place four or five are touched. Then like dactylium another spot becomes affected, and so it goes on. The trouble is mainly on the top beds, though some areas are on the middle beds curiously enough, near the door ends nearest the ventilation. I would suspect soil, or rather the inefficient sterilization of same, but since there is little or nothing to be seen on the bottom beds I cannot honestly do that. We are picking the affected mushrooms off as they appear, but that does not prevent the next flush being affected. Can you help me with my problem?

I presume it was bacterial trouble? Increased ventilation and dusting with copper-lime are said to prevent it from spreading, though I have always been under the impression that adequate ventilation alone is the answer. Certainly the infection is usually more severe under conditions of high humidity. Rather than sterilize the soil, try an area with a higher pH first. Someone once said this did the trick. Actually we know far too little about bacterial diseases to be able to give each other adequate advice.

FRED. C. ATKINS.

Q. 75. I usually need 4 trucks (approximately 30 tons) of fresh straw manure to fill 2,000 square feet of indoor beds. On my last crop the 4 truck loads weighing 29 tons 7 cwt., which should have been sufficient, in fact filled only 1,500 square feet, leaving my fourth bed bare. I think the manure, which received 5 turns during approximately 5 weeks was over-composted and went in too short for my liking. Could composting a week too long account altogether for this 25% shrinkage?

The fact that the heap had five turns instead of four would not in itself be responsible for the 25% shrinkage. All growers must be prepared for a substantial shrinkage of fresh horse manure from the time the manure is loaded on rail, due to evaporation and fermentation. Growers are well aware of the shrinkage in bulk at each turning, especially where the straw content is high and the droppings low. Under certain weather conditions a heap often demands that extra turn before it is ready, although each turn shortens the compost and increases the shrinkage.

C. P. CHAMBERLAIN.

Probably 25% is an average shrinkage during composting. Over-composting is very wasteful, because it means there is less food left for the mushroom. The reduced bulk is aggravated by the fact that, as the straw is shorter, the beds pack more tightly. It should not be forgotten that the loss of weight *en route* from stables to farm varies considerably according to the time taken and the weather prevailing, as Mr. Alan Condell explained so clearly in the 1946 Year Book. I have heard numerous complaints that manure to-day does not go as far as it did before the War; is it the quality of the straw?

FRED. C. ATKINS.

Q. 76. We have great trouble and difficulty in getting sub-soil for casing the beds. It has occurred to us that it might be feasible to sterilize the old casing soil by heat and, or Formalin and to use again. Do you think there is any objection to this?

I once used a small quantity of old casing soil which had been exposed to the weather for three years—with fatal results; it had not been sterilized. Sterilization would have to be perfect—preferably steam sterilization rather than Formalin or Cresylic. Failing any subsoil I would prefer the sterilizing of any available top spit to the using of old casing soil. I know of no one who has been driven to this extreme.

C. P. CHAMBERLAIN.

Try both—on a small scale, say 10 sq. ft. I don't like the idea, but cannot think why.

FRED. C. ATKINS.

Q. 77. We have a cultivation house made of bricks and asbestos-cement, lined inside with asbestos sheets. The size of the house is 106' x 19' x 11' and it contains two ventilators about 10" in diameter located about 35' from each end. The house is heated by electric pipes and has five layers of beds. We have experienced some trouble regarding excess of moisture and are afraid of the accumulation of carbon dioxide. The moisture is condensing and dripping on the upper beds. Would you advise us, having in mind the construction of the house, of the additional ventilation necessary, or could it be adequately corrected by the occasional opening of doors. We are considering the use of calcium hydroxide ($Ca(OH)_2$) or other chemicals for the removal of carbon dioxide. We have also been contemplating the use of fans. What do you advise?

These all-concrete buildings are excellent in many ways but condensation is more acute than in any other type of building. I would say instead of two ventilators in 106 ft. run five would not be too many. Installation of a fan either end would help considerably, for within this structure there is nothing to absorb the humidity and condensation except the beds. Bricks, concrete beds and flooring all tend to aggravate the moisture content of the building. Another type of lining other than flat asbestos would have helped to reduce the excess moisture. Opening the doors on favourable days for an hour would help.

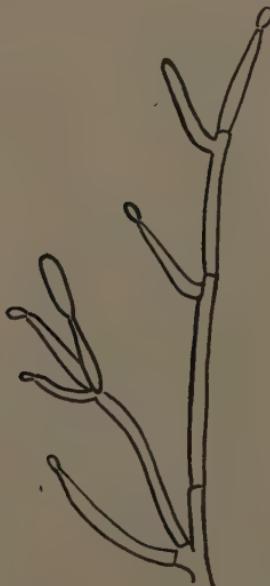
C. P. CHAMBERLAIN.

My only comment is this: in our houses, which are barely one-third the length of this one, we have five larger ventilators compared with these two and they are not too many!

FRED. C. ATKINS.



DACTYLIUM overgrowing mushrooms. (Stanley Middlebrook)



Semi-diagrammatic microscope
drawing with camera lucida



Microphotograph
(McG. Bulloch)

DISEASE CAUSED BY

DACTYLIUM Spp.

* * *

Alternative Names :

Cobweb, Mildew, Soft Decay.

Characteristics :

Mushrooms which are attacked are covered by a cobwebby mass of white mycelium which develops a delicate pink flush as spores mature. Mycelium travels rapidly over the surface of the casing soil, forming a felty layer 10 to 20 mm. thick. Mushrooms which are over-run rapidly mummify and turn brown.

Original Source of Infection :

The casing soil. Beds may also become infected by flies, tools, workers and airborne spores. Trouble may be disseminated by watering before the removal of diseased mushrooms.

Prevention :

Use sterilized casing soil, or soil free from *Dactylium*. "Trash" thoroughly. Keep down fly population. Avoid strong air currents.

Control :

Remove at once all diseased specimens and spray with 4% Formalin an area within a radius of at least 6 inches. Never water beds before doing this. Drastically reduce temperature, in order to reduce watering. Increase ventilation. Bleaching powder with lime said to give good control.

Description of Causal Organism :

Dactylium dendroides Fries.

Forming whitish effused, byssoid tufts; fertile hyphae erect, septate, main branches usually subopposite, branchlets in whorls of 3 as a rule, tips thin; conidia oblong, apiculate at the base, 3-septate, scarcely constricted at the septa, colourless, $26-32\mu$ \times $10-13\mu$.

AFTER MASSEE, 1893.

Author's Note :

The Americans and some workers in Great Britain are not convinced that *D. dendroides* is the principal species concerned in this disease of the cultivated mushroom.

FRED. C. ATKINS.

IS RESEARCH UNDESIRABLE?

A REACTIONARY BLAST

There is no doubt that manure can be improved by research, but what will happen when they find a substitute for stable manure and every Tom, Dick and Harry can buy as much of it as they want for mushroom culture? asks a correspondent who wishes to remain anonymous.

Surely there can be one answer and that will be that the price of mushrooms must fall to about 3d. or 4d. a pound, which fact is the one big dread that most of the large mushroom growers have at the back of their minds, he goes on. There are some huge mushroom growers in England who have mentioned to me that they are not at all keen on two points: 1, encouraging a lot more growers to come into the Mushroom Industry; and 2, they are very averse to finding a cheap substitute for stable manure. Their attitude is that if both these points are encouraged, the price of mushrooms will fall to 3d. or 4d. a pound.

They have told me that for years they, their fathers and their grandfathers have experimented in mushroom growing, and they are not at all keen on passing on their secrets to other new folk. They are only interested in two things: Making a good livelihood themselves and in keeping up the price of mushrooms.

They have told me that they do not want any research, but they would like a Board set up by the Mushroom Growers to keep imported mushrooms from coming into this country and lowering the price.

They have also told me that if there were thousands of tons of mushrooms grown in England and if everyone could buy them at about 2d. a pound, they would soon become unpopular. The only reason people are keen on mushrooms to-day is that they are a luxury. They are wanted because it is not everybody that can buy them, and the average person cannot afford to buy many of them.

The reason we are so keen on nectarines, grapes, pineapples and peaches is that we do not get a sickener of them because we cannot afford to buy very many of them. If they could be bought at the price of potatoes the public would very soon get a sickener of them and the price of these commodities would fall. You are no doubt aware that firms who grow grapes make an extraordinary good living out of them, as there is a good margin of profit.

Some of the largest Mushroom Growers buy between 20 and 30 railway wagons of manure every week throughout the whole year so that you can no doubt imagine the amount of mushrooms they produce during the season. It is of these I am speaking now. No doubt you will have heard their views also and know what goes on in their minds. It certainly seems foolish to encourage anything that will bring down the price of mushrooms to a very low figure, especially as most of the Mushroom Growers are now making a good livelihood.

SIR OLIVER LEES on RESEARCH

"Without it the future is bleak."

In my role as the Research representative on the Executive Committee of the M.G.A. I feel that I cannot allow the anonymous letter appearing in this issue of the Bulletin, under the heading 'Is Research Undesirable?', to pass unchallenged.

The writer appears to suggest that if horse manure were more plentiful mushrooms could be grown and sold profitably at 3d. per pound. At a profit—because if it were not profitable to grow at this figure people would have to stop growing, and the price would automatically rise again until it reached an economic level.

I would refer members to page 95 of the last Bulletin, No. 11, on which Dr. Edwards is reported to have told Worthing growers that synthetic composts are not likely to be cheaper than horse manure to-day (i.e. 60/- a ton, plus carriage), that a new composting technique is likely to be required, that in **skilled hands** yields of 2 lb. or more might be obtainable, and that yields might well be as variable as they are with horse manure. In other words, the position will only be altered insofar as the Mushroom Industry will be able to carry on, whereas without horse manure it might and probably would succumb.

I would contest the attitude of those growers who, according to the correspondent, are not keen to divulge their secrets to newcomers. As Dr. Ware has said, secrecy has helped to perpetuate many wrong practices in technique, and its banishment would mean a good step along the road to enlightenment and prosperity. This is one of the prime purposes of the M.G.A., and I believe that we have already encouraged both industrial growers and the Mushroom Industry as a whole to advance a considerable way towards our goal.

What can be said about the price of mushrooms? Personally I feel that if research resulted in greater efficiency, lower production costs, and higher yields, no one should mind a reduction in price, at any rate from to-day's level. Within reason, the cheaper mushrooms become, the more consideration shall we receive at the hands of Government departments who now are prejudiced by our being what they consider to be in the luxury class, a fact which is very far from true as the bulk of our mushrooms are bought by the quarter for smaller homes—where they make a welcome variety in the monotonous diet of to-day.

I am a firm believer that, without research, the future of the Mushroom Industry is bleak indeed. Its basic material, horse-manure, is becoming increasingly difficult to obtain and its price is always rising. Unless an alternative is found (and practically no work is being done in this field for the industry at large) what is the prospect? There are also 101 other problems which fill the discerning grower with concern. I need only refer to Truffle and Mat Disease, which have caused such widespread losses and about which we know practically

nothing; not to mention the urgent need to master the employment of the many insecticides and fungus-disease preventatives concerning which an M.G.A. Committee is now doing valuable preliminary work.

It seems to me that this may perhaps be the moment to ask how many growers would be prepared to pay £10 a year for Research on a National Scale—I would remind them that it would be a trading expense and so not subject to tax. It would be helpful to know the extent of the interest of all growers—whether or not they are members of the M.G.A.

It would be a wonderful advance in the history of British Mushroom Growing if the majority of growers would back the M.G.A. in its negotiations with the Ministry to provide an efficient Mushroom Research and Advisory Service—open to all—and controlled by Ministry and Growers, side by side. Would not a service of this sort be well worth a few pounds annual subscription by growers large and small?

We can only expect an efficient nation-wide Mushroom Research and Advisory Service at low cost to each one of us if we are *all* prepared to come in.

MARKETING MUSHROOMS

The Mushroom Growers' Association has given support *in principle* to the National Farmers' Union's draft Marketing Scheme for Horticultural Produce, taking the view that, if marketing is to be controlled, let the controls be of our own devising.

In the unfortunate event of growers failing to take united action to deal with their marketing problems themselves, the Union believes there is grave danger that the Industry will have an unpractical scheme permanently fastened upon them and controlled by bureaucrats out of touch with the problems of the producer.

The Union's draft scheme, which has been approved in principle by all County Branches and by a London meeting of representatives of all the Commodity Committees, is of a regulatory nature which will allow for the minimum control of those sections of the Industry which merely want this umbrella should the rains come. The Union is bitterly opposed to, and will fight with everything it has, anything set up by the Ministry of Food which is not sympathetic to our interests and the interests, in the Union's opinion, of the consumer.

The scheme aims to improve supplies to the consumer, to be brought about by the establishment of more grower co-operative societies and the building up of an effective market intelligence system. The Union will *recommend* grades and greater standardisation, thus improving the presentation of home produce and encouraging the public to Buy British with confidence.

Although it is a comprehensive scheme, provision will be made for the particular requirements of the different commodities—a very important consideration where mushrooms are concerned.

In working out these plans, study has been made of the experiences of other countries, and in every case it has been found that co-operative marketing schemes flourished when built up by the producers themselves, but failed when imposed upon them.

IS RESEARCH TOO COSTLY?

"40 Woodbines a Week," says Harry Allsop.

All members of the Mushroom Growers' Association to whom I have spoken are in favour of Research into Mushroom problems, but that is as far as it goes, says Mr. Harry S. Allsop, Scotland's representative on the M.G.A. Executive Committee, in a letter to the Bulletin. He goes on :

For this state of affairs in one way I blame the Mushroom Research Association Ltd., for not telling us what they are doing. How can one be expected to contribute to a cause if one is not informed what is being done, or what the programme is and how far they have got in their research on various problems which confront us all from time to time?

I do believe that many M.G.A. members are under the impression that the M.R.A. are experimenting on one thing only, namely, Synthetic Compost, which is of course absurd. If I were asked by a fellow-grower how to combat a bad attack of Mycogone, for example, no doubt he would be dumbfounded if I told him the M.R.A. had a liquid preparation that would kill this and similar diseases and at the same time in no way injure the mushrooms on the bed. Well, I understand the M.R.A. have found such a solution, but in the tradition of all scientists, many many trials must be conducted before it will be made available to those growers who are contributing towards this research.

Now how much would this research cost the members of the M.G.A. if they all contributed? As many know, the M.R.A. is run by a few growers who have spent thousands of pounds on this project to insure themselves against possible ultimate extinction in the mushroom business, and now some of them are feeling this burden almost unbearable—and no wonder. It makes me feel terribly mean to have done nothing to assist them, and I know many other M.G.A. members feel the same way about it, but we seem reluctant to get together to discuss what we can do. Hence this note to all members of the M.G.A.

All we need to contribute in this way to safeguard our businesses is the price of two 20 packets of Woodbines a week. But we neglect to do so.

If EVERY member of the Mushroom Growers' Association would only undertake to make such a contribution, no doubt we could get a grant from the Government and our industry could at last be set upon sure foundations.

Dr. R. L. EDWARDS, Director of Research, Mushroom Research Association Ltd., Yaxley, was approached by the Editorial Board of this Bulletin, as it was felt Mr. Allsop's comments might give rise to some misunderstanding. Dr. Edwards later issued the following statement (20.5.48) :

By courtesy of the Editor I have seen Mr. Allsop's letter before publication in the Bulletin.

In order to avoid misunderstanding it should be explained that the liquid which will kill mushroom diseases without injuring the mushroom is a possibility of the future. We are working on such a preparation and we have antibiotic material which will kill disease organisms without killing the mushroom in pure culture, but this has not yet been made in bulk or tested on mushroom beds, and we have no idea of its cost on a commercial scale. All of these and several other problems must be solved before this revolutionary treatment of disease can be applied to the mushroom.

Some other subjects on which research is in progress or contemplated were mentioned at a meeting at Worthing, reported in the April Bulletin. We have always welcomed visits from growers interested in research, and we show them as much as possible of our programme.

ADVICE TO ADVISERS

"TAKE GROWERS INTO YOUR CONFIDENCE"

The M.G.A. Chairman, Mr. Stanley Middlebrook, spoke for over an hour on Practical Mushroom Growing to the quarterly Provincial Horticultural Conference at the School of Agriculture, Sutton Bonington, Notts., on 5th May. He was addressing the Horticultural Staffs of the N.A.A.S., the C.A.E.Cs., and local Education and Municipal authorities.

After giving a brief résumé of textbook methods of growing mushrooms, Mr. Middlebrook went on to elaborate some of the tricky details of practical production which do not, because of their unrecordable nature, appear in the textbooks. He stressed that particular attention should be given to composting, choice of and management of soil, and to cleanliness throughout the plant.

Mr. Middlebrook concluded with these words of advice : "There are three most important points to watch in commercial mushroom growing. First, there must be a full growth of mycelium in the compost. Second, there must be an equally full growth in the casing soil. Without these there will be no success. But with them, and with commonsense management of moisture and ventilation, success is reasonably assured, provided full attention is paid to the third point -thorough day-to-day cleanliness inside and outside the houses.

" If, as I have said, it is difficult for one experienced grower to advise another who may be in trouble, how much harder it is for the official Adviser, whose practical knowledge is necessarily more limited, to give the desired help. I advise you to take the mushroom grower into your confidence and be willing to learn from him before you start advising him. Once you have acquired a working knowledge of these problems your service will start to function and you can collect and collate information and advice which will make you a welcome visitor at any farm."

IMPORTING MUSHROOMS

COMMENTS ON THE PROPOSED CHANGE OF DUTY

An all-round increase in production costs since 1932 has rendered the present Import Duty on Mushrooms of 8d. a lb. quite inadequate to protect the home grower, and the attention of the Union's Central Horticultural Committee has been drawn to this fact on several occasions since the prospect of an alteration was first discussed early in 1946.

The M.G.A.'s objective has been 1/6 during the summer and 2/- for the remainder of the year. The Geneva Conference, however, accepted the representations of certain European countries and approved *ad valorem* duties of 10% in summer and 20% in winter. (These figures, incidentally, appear to relate only to raw mushrooms.)

Further grounds for disquiet have been the devaluation of the franc, giving importers a big price advantage, and the allocation this summer by the French Railways of a large number of refrigerated trucks at a specially-low hire charge to facilitate delivery of fresh fruit and vegetables from the French producing areas to the English provincial markets.

Accordingly the M.G.A. has notified the Union that, although it has no wish to withhold supplies from the home market in an attempt to bolster up falling prices, **it reserves the right to make representations against what is tantamount to a reduction in the present Duty.**

The Union is free to press the Government for increases in Duty, should circumstances justify such action, and agrees that mushroom growers have grounds for dissatisfaction. In the words of the Deputy President, Mr. E. H. Gardener : An *ad valorem* Duty merely lowers the Duty payable in proportion as the price drops, exercising thereby little effect in discouraging imports on a surfeited market ; a specific Duty means that the lower the price the greater, proportionately, is the Duty, and the more the deterrent effect on imports.

Why is the Government so keen on importing mushrooms ?

It was reported in 1946 that it was forced to write food commitments into its military agreements. Then it was stated that importing countries were imposing conditions of sale, such as : " If you want our cheese you must take our tomatoes." But Mr. Strachey, the Minister of Food, had this to say regarding the importation of mushrooms (among other highly-priced produce) : " These foodstuffs help to provide greater variety in our diet, and I hope to get more of them. I am satisfied that the Foreign Exchange involved could not at the moment be spent to greater advantage in other ways."

As a Member of Honour of the Federation Nationale des Syndicats Agricoles des Cultivateurs de Champignon, I asked the French growers for their views. The Secretary, M. Dekeirel, replied (3.5.48) : " French mushrooms are not so appreciated as British on your markets. There is a difference of 1/6 to 2/- per lb., so it is practically impossible for us to sell our produce through your commission salesmen. Only a few French growers export direct to London shops—at the most 2,000 lb. of mushrooms a week—and I think these supplies will decrease this summer by reason of the warm weather."

F.C.A.

THE GRADING OF MUSHROOMS

COMMITTEE'S TENTATIVE PROPOSALS

A Committee to investigate the possibility of formulating grades acceptable to grower, wholesaler, retailer and consumer alike, has been set up by the Mushroom Growers' Association, as promised at the Second Annual Meeting. Mr. W. A. B. Harding is Chairman, and with him are Mr. J. Stewart-Wood and Captain M. E. Few.

The recommendations of this Committee are tentative, and unanimity among the three members was not gained, as was to be expected on so controversial a matter. It is therefore suggested that all members of the M.G.A. should give them close study, and submit their comments at the earliest possible moment to the Secretary.

SUGGESTED GRADES

(1) **BUTTONS.** Membrane closed, stem length not to exceed $\frac{3}{4}$ of an inch, Cap diameter $\frac{1}{4}$ to $2\frac{1}{2}$ inches.

(2) **CUPS.** Membrane closed, or open but with the Cap retaining a pronounced downward curve. Cap diameter $\frac{3}{4}$ to $2\frac{1}{2}$ inches. Stem length not to exceed 1 inch from the apex.

(3) **FLATS.** Being those which have advanced beyond the Cup stage. Stem length not to exceed 1 inch. Cap diameter $\frac{3}{4}$ to $2\frac{1}{2}$ inches.

Tolerance. To allow for variations incidental to proper Grading and Packing, a tolerance of 5% to be permitted in each Container sold under "The Mark."

Other Grades such as "Small Buttons" (under $\frac{3}{4}$ inch), "Large Flats" (over $2\frac{1}{2}$ inches), and others, may be used to suit local requirements, but may **not** be sold under "The Mark."

Ungraded. Mushrooms not complying with the above to be relegated to a Pack labelled "Ungraded" and **not** sold under "The Mark."

Stems. To be packed separately, labelled "Stems" and **not** sold under "The Mark."

SUGGESTED PACKS

- (1) Varieties to be packed separately according to Colour.
- (2) All Graded Mushrooms to be free from :—Dirt, Disease, Insect Damage, Malformation, Pronounced Discolouration or other serious blemish.
- (3) Each Grade to be in a separate Pack.
- (4) Mushrooms to be laid in the Container, stem upwards, in orderly layers, to within one inch of the top of the Container at the time of packing.
- (5) Blue Paper Lining recommended, but optional.
- (6) Size of Containers optional to allow preference being given to the particular markets served.
- (7) Nett Weight not to exceed 6 lbs. (preferably 4 or 5) in any one Container, and contents measured to the lower $\frac{1}{2}$ lb., no other fractions being permitted.
- (8) Type of Container to be the Wooden Chip when obtainable, otherwise the Cardboard Container may be used.
- (9) Covers to be of Wood, or Cardboard, and to be securely fastened. A Paper Over-Cover may be added, but not Cellophane or material of similar type.
- (10) The Cover, or Over-Cover, to be marked **indelibly** with :— Type (colour) of Mushroom, Grade, Nett Weight, and “The Mark,” the Container being **indelibly** marked with the Date of Dispatch.

SUGGESTED “ MARK ”

- (1) The Mark to be known as “ British Cultivated Mushrooms,” and may be abbreviated and monogrammed as “ B.C.M.”
- (2) To be issued to approved Members of the M.G.A. free of charge.
- (3) To be issued to approved Non-Members at a charge to be fixed by the M.G.A. and which may be varied from time to time at the discretion of the said Association.
- (4) Members and Non-Members are approved on signing a Form of Undertaking :—
 - (a) to sell under the Mark only such Mushrooms as comply in all respects with the M.G.A. regulations governing the Grading and Packing of same.
 - (b) that these Mushrooms are obtained only from their own crops grown under Glass, or in Sheds, or Caves, or on Open Manured Beds other than grassland; i.e., under controlled conditions.

(The Form of Undertaking should be submitted to the M.G.A. Solicitors before being passed into use, in order to ensure successful prosecution against infringements, etc.)
- (5) Design of the Mark to be undertaken by someone having the necessary talent. (Possibly by the person responsible for designing the M.G.A. Monogram, or by submitting the matter to members in the form of a Competition.)

Dr. Edmund B. Lambert on

THE CONTROL OF BUBBLE

" COMPLETE PROGRAMME IS NECESSARY "

Most commercial growers are familiar with the symptoms of the destructive disease of cultivated mushrooms known in the United States as bubbles or mycogone and in France as la môle. It is caused by a fungus called *Mycogone perniciosa*, which grows into the mushroom and transforms it to a distorted putrid mass. Soon after the parasite attacks a mushroom it produces a layer of white or brown spores over the surface of the diseased mushroom. These spores are spread about by currents of air, by insects, workmen, etc. They may be lifted or deposited by convection currents and blown about through the air like dust particles too small to be seen unless floating through a beam of light in a dark room. Like many other fungous spores, they are able to germinate and grow immediately if conditions are favorable, or to live through a long rest period under unfavorable conditions. They may infect healthy mushrooms, grow in soil or compost, or remain in a resting stage for several months or even years.

The recurrence or accumulation of the disease from one crop to another indicates that the Mycogone fungus either is remaining alive inside the house from one crop to another or is being carried into the house during one of the cultural operations. There are several possible methods of introducing the fungus into the house: (1) By air or on insects entering through doors or ventilators, (2) in water, (3) spawn, (4) compost, (5) soil, and (6) by workmen.

Burning sulphur and fumigating with formaldehyde between crops are practical methods of eradicating Mycogone from the house. Experiments have shown that the burning of one-fourth pound of sulphur per 1,000 cubic feet of air space in a closed container will kill Mycogone spores. When it is used as a combination insecticide and fungicide, sulphur should be burned at the rate of 5 pounds per thousand cubic feet of air space. Formaldehyde is used at the rate of 1 pound of the commercial preparation per 1,000 cubic feet of air space. If either of these methods of disinfection is used there will be little or no disease due to inoculum persisting within the house from one crop to another.

The danger of infection due to spores carried into the house in the air or by insects can be materially reduced by removing spent mushroom manure and all mushroom refuse from the immediate vicinity of the house and occasionally disinfecting the soil around the house. Various solutions are suitable, such as lysol, 2 per cent; formalin, 2 per cent; or bichloride of mercury, 1 pound to 60 gallons.

Infection from contaminated water or spawn can be largely avoided by using water direct from deep wells and by using bottle spawn. To prevent the growth of green mold and other contamination in spawn bottles, spawn makers transfer bottle spawn under as nearly aseptic conditions as possible. Because of this there is little chance for Myco-

gone to be distributed in bottle spawn. Furthermore, if clear-cut cases of the distribution of disease in spawn should arise it would be a comparatively simple matter for the spawn maker to trace the source of infection and start again with clean cultures.

Mycogone Eradicated by Heat

A good "heat" in the mushroom house during the final fermentation is the most effective method known of eradicating Mycogone from mushroom compost. All of the evidence at hand indicates that an air temperature of 120° F. for 48 hours in a mushroom house will eradicate the fungus from the air, compost, and soil. Obviously, this temperature must be obtained in all parts of the house to eradicate the fungus completely. Therefore it is advisable to use some means to circulate the air to prevent temperature layering. Some growers accomplish this by opening the ventilators very slightly, others set large electric fans tilted up at an angle of 45° in the center aisle. It is also advisable to raise the lower beds off the floor to allow a circulation of air under them. Even when these precautions are taken it often happens that the manure is too wet or overcomposted to heat the air in the house to 120°. To insure against this condition some growers are providing themselves with auxiliary steam-heating systems to obtain artificially the desired temperature in the house during the "heat." This practice has given satisfactory results in the United States Department of Agriculture experimental mushroom house since it was first used in 1928 and seems to be a logical step in the right direction.

Outbreaks From Infested Casing Soil

Circumstantial evidence indicates that most of the severe outbreaks of "bubbles" in commercial houses in the United States are due to infested casing soil. Losses from this source can be eliminated by avoiding the use of contaminated casing soil, which usually is soil from fields that have been fertilized with spent mushroom manure or that have been subject to the drainage overflow from such fields. To determine whether soil is contaminated, small test beds may be cased with soil samples out of fields from which soil will be taken for subsequent crops. If soil infestation becomes general and there is no Mycogone-free soil available, the fungus can be eradicated from the soil by placing it inside the mushroom house during the "heat." Soil to be treated in this way should be placed near the top of the house, where the temperature is highest, and a temperature of at least 120° F. must be maintained in the soil for 48 hours or more.

The spread of the disease by workmen can be largely prevented by a few common-sense rules. For example, men who have been working with contaminated casing soil should not be allowed to cut mushrooms without first washing their hands; likewise, the removal of the occasional diseased mushroom often occurring on beds that are otherwise clean should be made a separate job and not done by men who are cutting mushrooms for market.

After infection has become widespread in a house a moderate amount of loss is inevitable, but the disease can be somewhat reduced by growing the crop at a low temperature, 50° to 55° F.

From the foregoing discussion it is apparent that a complete program of control is necessary to combat the disease effectively. So far as possible the spores and mycelium of Mycogone must be eradicated from the house and all avenues of entrance must be closed. Since the causal organism is capable of rapid reproduction, the neglect of one source of inoculum may render useless the measures taken to control others. Because of the various conditions under which mushrooms are cultivated, each grower must plan a control program to suit best his individual needs. The measures outlined above apply particularly to the prevention of the disease in standard mushroom houses. In heavily infested areas they will not assure a 100 per cent control, but if carefully followed they will prevent serious outbreaks and control the disease sufficiently for practical purposes.

Reprinted with the Author's permission from the U.S. Department of Agriculture's Year Book of Agriculture, 1931.

ROBERT PATTERSON, B.Sc., B.

Agr. (Queen's University, Belfast), is the very keen member of the Executive Committee whose farm is at Ballygowan, Belfast. He spent most of the war years in the Colonial Government Service in Africa, serving for a while with the Royal West African Frontier Force. Upon being invalided from the Colonial Service he returned to farming and mushroom growing in Northern Ireland. Asked about his views on the Mushroom Industry he said, "The next few years will see a marked increase in the production of home grown mushrooms and until the consuming public is made more mushroom conscious, prices will continue to decline. The decreasing horse population is the mushroom grower's greatest worry and will continue to be so until science gives us a satisfactory synthetic compost." Mr. Patterson is one of the 'air-minded' members of the Executive Committee, using this method of travel for the great distance he has to come to attend meetings in London. Growers who do not like to leave their farms for any length of time will appreciate the sacrifice of time and money made by the members who travel long distances in the interests of the M.G.A.



ROBERT PATTERSON, B.Sc., B.Agr.
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M.G.A. HONOURS SCIENTISTS

LIFE MEMBERSHIP MARKS INDUSTRY'S APPRECIATION OF WORK BY DRs. WARE & LAMBERT

William Melville Ware, D.Sc. (London), author of *Mushroom Growing* (Ministry of Agriculture Bulletin 34) and until his recent retirement the Advisory Mycologist at the South-Eastern Agricultural College at Wye, has been elected the M.G.A.'s first Life Honorary Member in recognition of his outstanding services to the Mushroom Industry in Great Britain.

He writes : " I greatly appreciate this high honour and particularly the kind thought of the Executive Committee. I have much pleasure in accepting for, as I have always said, an interest in mushroom growing once aroused will persist and this gift of the Association will permit my own to live, largely through the medium of the Bulletin."

Dr. Ware has a host of friends among mushroom growers, for he has always been ready to give them all the help within his power, and this has often been considerable, for most of our problems have at one time or another been personally investigated by him in his official capacity. He was among the first to extend a welcome to the M.G.A. in 1945, when he wrote : " I am glad to hear of the formation of the Mushroom Growers' Association within the N.F.U.—a union taking place within a union. At the time of my first contact with the industry I gained the impression that mushroom growers had two characteristics ; one was that they maintained individual secrecy at all costs, and the other that they maintained an undying interest in their occupation. The secretive character has been largely lost and this is a change for the good, because there is now a chance for fresh knowledge to come to the ears of more than a few and a chance for that knowledge to circulate freely. There is no doubt that secrecy helped to perpetuate many wrong practices in technique. To me it seems that the formation of this Association and the co-operation between growers which it indicates is a sign that individualism is banished and a good step taken on the road to enlightenment and prosperity. The second characteristic of mushroom growers seems firmly attached. The crop, and the work it involves, somehow possess a special attraction for the grower and evoke, both in difficulty and success, a remarkable personal interest which is not by any means found in all branches of Horticulture. Without such interest, good work is not done and there is still much to learn. May the Mushroom Growers' Association prosper!"



DR. W. M. WARE

Among his many publications on plant pathology in general are the following concerned with mushroom matters :

Mushroom Growing. (*Ministry of Agriculture Bulletin* 34.) 1931-1946.
 A Disease of Cultivated Mushrooms Caused by *Verticillium Malthousi* sp. nov. (*Annals of Botany*, 47.) 1933.
 Plaster Moulds in Mushroom Beds. (*Gardeners' Chronicle*, 96.) 1934.
Clitopilus cretatus as an Invader of Mushroom Beds. (*Gardeners' Chronicle*, 97.) 1935.
 Mushrooms. (*Journal of Royal Horticultural Society*, 59.) 1934.
 La Culture du Champignon de Couche en Angleterre et aux Etats-Unis. (*Bull. Chambre Synd. Cultiv. Champ. de France*.) 1935.
 Mushroom Growing in the United States. (*Agriculture*, 42.) 1935.
 Mushroom Growing. (*Modern Garden Craft*, 3.) 1936.
 When Trouble Occurs, with details of how to pack specimens for the laboratories. (*M.G.A. Bulletin*, 3.) 1946.
 With W. Buddin : *Clitocybe dealbata* as an Invader of Mushroom Beds. (*Gardeners' Chronicle*, 93.) 1933.
 With H. H. Glasscock : Investigations on the Invasion of Mushroom Beds by *Pseudobalsamia Microspora*. (*Annals of Applied Biology*, 28.) 1941.
 With H. H. Glasscock : Pure Culture Mushroom Spawn. (*Agriculture*, 53.) 1946.

DIRECTOR OF U.S. MUSHROOM RESEARCH



DR. EDMUND B. LAMBERT

Similar recognition has been accorded Edmund Bryan Lambert, Ph.D., formerly Pathologist with the Division of Mycology and Disease Survey, United States Bureau of Plant Industry, for his remarkable volume of work in the interests of the Mushroom Industry in America. In his reply to the M.G.A. Executive Committee's invitation, Dr. Lambert said : "I assure you this is a very pleasant and unexpected surprise. I feel deeply honoured, and will be pleased to accept the life membership."

Dr. Lambert returned in May to the U.S. Department of Agriculture to take charge of a newly established project on **Mushroom Research**.

His formal training has been in Plant Pathology and Genetics in the University of Minnesota. From 1920-28 he was engaged principally in work on cereal rusts and smuts for the experiment station at the University of Minnesota and the United States Department of Agriculture. From 1928 to 1943 he was in charge of research work for the Department of Agriculture on mushroom culture and diseases, with

headquarters in Washington, D.C. In 1943, 1944 and 1945, he was engaged in converting a Mushroom Spawn Factory to war time production of Penicillin and Streptomycin, and from that time until the present, in mushroom research and practical mushroom growing for the Keystone Mushroom Co. and the L. F. Lambert Spawn Co., at Coatesville, Pennsylvania.

Dr. Lambert's publications include :

The production of normal sporophores in monosporous cultures of *Agaricus campestris*. (*Mycologia*, 21.) 1929.

Normal Mushrooms from Artificial Manure. (*Science, n.s.*, 70.) 1929.

Studies on the Relation of Temperature to the Growth, Parasitism, Thermal Death Points and Control of *Mycogone perniciosa*. (*Phytopathology*, 20.) 1930.

Two New Diseases of Cultivated Mushrooms. (*Phytopathology*, 20.) 1930.

Synthetic Compost for growing Mushrooms developed by B.P.I. (U.S. *Dept. of Agric. Off. Rec.*, 10.) 1931.

Mushroom Disease known as "Bubbles" controlled by Exclusion and Eradication. (*U.S. Dept. of Agric. Year Book of Agriculture*.) 1931.

"Bruise Spot" disease of Cultivated Mushrooms widespread in 1931-1932. (*Plant Disease Reporter*, 3.) 1932.

The Truffle Disease of Cultivated Mushrooms. (*News Letter, B.P.I.*) 1932.

Mushroom Growing in the United States. (*Circular 251, U.S. Dept. of Agriculture*.) 1932.

Effect of Excess Carbon Dioxide on Growing Mushrooms. (*Journal of Agricultural Research*, 47.) 1933.

Size and Arrangement of Plots for Yield Tests and Cultivated Mushrooms. (*Journal of Agricultural Research*, 48.) 1934.

Principles and Problems of Mushroom Culture. (*Botanical Review*, 4.) 1938.

Studies on the Preparation of Mushroom Compost. (*Journal of Agricultural Research*, 62.) 1941.

Mushroom Growing in the United States. (*Farmers' Bulletin*, 1875.) 1941.

Indoor Composting for Mushroom Culture. (*Circular 609, U.S. Dept. of Agriculture*.) 1941.

Recent Developments in the U.S.A. (*M.G.A. Bulletin* 6.) 1947.

With A. C. Davis : Distribution of Carbon Dioxide in Mushroom Compost Heaps as Affecting Microbial Thermogenesis, Acidity and Moisture therein. (*Journal of Agricultural Research*, 48.) 1934.

With H. Humfeld : Process of Growing Mushrooms. (*U.S. Patent 2,060,223*.) 1936.

With H. Humfeld : Mushroom Casing Soil in relation to Yield. (*Circular 509, U.S. Dept. of Agriculture*.) 1939.

ITEMS OF GENERAL INTEREST

Secretary's Bereavement : All members will learn with regret of the tragic loss sustained by our Secretary. Mrs. Angus Watson died on 6th May, after a long and painful illness. During the last War she served, until her marriage, in the Women's Land Army in Essex. There are a small son and daughter.



MR. C. E. HUDSON

Mr. Hudson succeeds Dr. Taylor : Congratulations to Mr. C. E. Hudson, Honorary Member of the M.G.A., who has been appointed Senior Education and Advisory Officer to the Ministry of Agriculture and horticultural head of the N.A.A.S., in succession to Dr. H. V. Taylor, good friend of the Association and Guest of Honour at our Second Annual Luncheon, who retired in April. Mr. Hudson, a specialist in glass-house production, was Deputy Provincial Director, South-Eastern Province, N.A.A.S., in which office he has been succeeded by Mr. O. G. Dorey, another Hon. Member of the M.G.A. *The Fruit Grower*, by whose courtesy we are able to print Mr. Hudson's photograph, remarks : "Mr. Hudson's sound

practical background and progressive ideas will make the choice a popular one among growers."

Short Term Storage of Fruit & Vegetables. Mushrooms can be stored for a period of from two to four days in a cold storage room, temperature 32° to 34° F, states Food Investigation leaflet No. 9 issued by H.M.S.O.

N.A.A.S. Changes. Mr. J. Duggan has been appointed County Horticultural Advisory Officer for Herefordshire in succession to Mr. C. Savidge. Mr. E. R. Keighley replaces Mr. T. Richardson in the corresponding office in Cheshire.

TECHNICAL ABSTRACTS

from THE REVIEW OF APPLIED MYCOLOGY

GROWING IN RUSSIA :

During the blockade of Leningrad, in 1942, when the food situation became desperate, the Town Committee V.K.P., together with the Botanical Institute, started experiments in mushroom (*Psalliota arvensis*) cultivation which is fully described in this study. The method of raising mushrooms from spores is compared with that of cultivating them from sporophore tissue, and the author recommends the latter method as being far more advantageous for commercial purposes.

NIKOLAEVA (Mme. T. L.) Experiments on growing mushrooms for industrial cultivation. Volume of Scientific Works, Leningrad, 1941-1943, U.S.S.R. Academy of Sciences, pp. 349-354, 2 figs., 1946.

NEW VERTICILLIUM DISEASE

White strains of the cultivated mushroom (*Psalliota campestris*) at Yaxley, Huntingdonshire, and Thornham, Norfolk, have recently been subject to attack by *Verticillium psalliotae* first described in Denmark, where it attacked the brown strain. White mushrooms at Yaxley were successfully inoculated with the fungus, the vigorous mycelial growth being visible to the naked eye after 48 hours at 20° C. Preliminary investigations have shown that *V. psalliotae* when grown on 2% malt agar (pH 5.5) at fluctuating laboratory temperatures produced conidia 4.3 to 12.9 by 1.75 to 2.15 μ broad compared with Treschow's measurements of 6 to 10.5 by 2 to 3.5 μ (loc. cit.).

ATKINS, F. C. A *Verticillium* disease of cultivated Mushrooms new to Great Britain. *Trans. Brit. Mycol. Soc.*, xxxi, 1-2, pp. 126-127, 1947.

CONTROL FOR DACTYLIUM?

Cultivated mushroom (*Psalliota*) beds at Poligny (Jura), when they have been in production for a month or more, have for some years past become infected by *Dactylium dendroides*. Very diffuse at first, the hyphae soon form isolated patches 10 to 30 cm. in diameter, consisting of a felty layer 10 to 20 mm. thick on the surface of the beds. Tufts of conidiophores develop later. Mushroom production becomes greatly reduced or is arrested in the affected patches. If a few buttons appear on the infected sites they reach a height of only 12 to 24 mm. and do not spread open. As the parasite develops, the stipe and the incurved edge of the pileus show a cobwebby mycelium consisting of loose tufts or small light bluish-grey parallel bundles connecting tangentially the pileus to the base. While most of the mushrooms on emergence bear very few traces of soil, the infected ones are recognisable not only by their reddish-grey, later brownish colour, but by the numerous grains of sand caught in the mycelial threads and accumulated on the surface. The infected sporophores rapidly mummify and turn brown. If a mushroom covered with a large amount of mycelium is cut longitudinally, the outermost part of the stalk and pileus is marked blackish-brown along a regular band 1 to 2 mm. sharply delimited from the deep part of the sporophore. This part turns a light buff colour, except for the central part which does not change. The base of the stalk becomes leathery and markedly necrosed.

Good control is given by using a paste consisting of bleaching powder and lime. Further tests are to be made with other materials containing chlorine.

Viennot-Bourgin (G). La culture du Champignon de couche. (Suit) VIII Dactylium dendroides parasite du Champignon de couche. (The cultivation of the edible mushroom. (Continuation) VIII Dactylium dendroides, a parasite of the edible Mushroom) *Rev. Mycologie*, N.S. xi, 1, Suppl., pp. 4-6, 1 fig., 1946.



MUSHROOM ABNORMALITY

The specimen shows an abnormality in the growth of the cap which is lobed instead of having an even circular margin. The central portion of the gill area is under-developed and is still covered by the partial veil which is in close contact with it. The lobes are well developed and bear normal gills which have developed to maturity and produced abundant spores.

The probable explanation for this abnormality is that during the development of the mushroom the veil covering the central gill area became fused with the developing gills which were therefore unable to proceed with their development owing to lack of space. At certain points on the margin which either had escaped fusion with the veil or had broken through it the cap was able to expand and develop normally thus accounting for the lobes.

C. J. La Touche.

LOSSES IN TRANSIT

Just now we are losing many more chips of mushrooms on the railway than usual. This fact in itself would not distress us, because these epidemics of pilfering occur from time to time, and we do get compensation, although they are a confounded nuisance to all concerned. What is causing us anxiety is the suggestion which has come to our notice that the Railway Companies may have to consider greatly increasing their charges for the transport of such desirable and easily stolen goods as 2 lb. mushroom chips. Is there anything we can do as growers to reduce this heavy drain on the Railway Companies' revenue, and so obviate the necessity for such an unfortunate step. Our local Stationmaster asks whether we could pack our chips in wicker baskets or heavy mesh boxes which could carry about 20 chips and be locked on the grower's farm before despatch to the local station. Is this a practicable proposition?

FRED C. ATKINS.

DECAYED BEDBOARDS

Fred. C. Atkins on Replacement

Replacement of decayed mushroom-shelving is no longer certain under one's Maintenance Licence. I recently applied for sufficient timber to replace bedboards purchased in 1937, and was told that such replacement was not intended to be covered by Maintenance Licence, which was for day-to-day repairs.

I applied to Timber Control. Despite County Agricultural Committee support and a Ministry of Works licence to expend the sum required, Timber Control rejected my application on the grounds that :

1. No more timber was likely to be made available for mushroom growers;
2. Concrete was a quite suitable alternative; and
3. There was no evidence of decayed timber on my farm.

Reinforced by data on the food value of the Mushroom and its folic-acid content, and by copies of Dr. Wilkins's " luncheon " assurance that there would be no discrimination against mushroom growers, the Hunts. Agricultural Executive Committee (in whose area Yaxley lies) made energetic representations on my behalf. In due course they wrote to me as follows :

" The Ministry of Agriculture state that they are prepared to support applications by mushroom growers for a reasonable quantity of timber to replace any which has rotted. They further state that if there is an urgent need for timber to replace rotten material, it is up to the firm to make out a case if this is the basis of their application."

" It is not the Ministry's policy to support an application for the use of timber for the building of additional houses or shelf space for the cultivation of mushrooms at the moment, but they give their assurance that replacement of timber that has rotted as a result of the cultivation of mushrooms will receive sympathetic treatment."

The District Officer of the Hunts. Committee adds this note : " I know that it is necessary for you to burn all rotten timber immediately for fear of infection from non-mushroom spores, and I therefore think that the question of the necessity for mushroom growers to produce evidence of rot would in actual fact mean convincing the Ministry of this fact, through their Officers."

I felt it would be as well to have authoritative counsel on this last point. Dr. Charles La Touche, the Mushroom Research Association's microbiologist, gave me his considered opinion (13.1.48) that " if such boards have at any time been in contact with or in the vicinity of mushroom beds invaded by diseases such as Truffle (which causes one of the most serious infestations of mushroom beds known in this country) such bedboards should undoubtedly be regarded as potential sources of contamination."

The foregoing is given in some detail because I feel it may be of use to others less inclined than I to kick against the pricks. I have Dr. La Touche's permission for all M.G.A. members to quote his opinion, if required.

FROM THE M.G.A. BOOKSHELF

Dr. Bels answers Col. Noel ?

Would YOU prefer caves to properly-designed and constructed houses, or even to glasshouses, for your mushrooms? I have taken part in a number of arguments—public and private—over this question, and during his recent visit to this country I tackled Dr. P. J. Bels, the Dutch specialist, on his experiences of all types. His reply is set down in detail in his "Champignonteelt in Nederland van 1942 tot 1946," a copy of which he has kindly presented to our Library. (He also showed me the accompanying photographs).

In South Limburg, he told me, during the past four years the yield from 12 caves averaged 17.6 kg. During the same period the yield from 11 buildings above ground averaged 35.0 kg.

Dr. Bels summarises this brief but carefully-compiled study of Dutch cultivation during five years as follows :

1. During this period mushrooms were cultivated in the Netherlands by about 25 growers. Twelve worked in subterranean quarries, the others had their plants in more or less modern mushroom houses or fairly suitable cellars and sheds.

2. In the period from 1942 to 1946, the total national output was about 400,000 English pounds of mushrooms. The crop from quarries came to half of this amount. The other half was produced in mushroom houses, cellars and sheds. To get the same amount of mushrooms the growers in the quarries needed twice as much manure as did the growers otherwise accommodated. In other words, the yield in the quarries was about 40 pounds per ton of manure; in the houses, etc., about 80 pounds.

3. When compared with the production per ton in the United States and Great Britain the yield in the Netherlands is very low.



4. Although abundant crops may occur in the Netherlands, the average figures show that they are exceptions.

5. Nearly all mushroom growing in France, Belgium and the Netherlands is carried on in the old classic French way, i.e., empirically. The results fluctuate markedly and the average production is low. In the U.S.A. and Great Britain the methods applied in mushroom cultivation are more scientific and rational. The fluctuations in the results are smaller and, in comparison with the above, average yields are high. An important advance in Dutch mushroom growing can only be obtained by introducing new modern methods.

6. It will be difficult to change the methods of cultivation in quarries. F.C.A.



ADDITIONS TO THE LIBRARY.

History of Mushroom Growing in the Netherlands from 1942 to 1946, and Champignonteelt in Engeland, both by Dr. P. J. Bels (presented by the author); *Mushroom Culture* (1870), by W. Robinson (presented by Mr. H. H. Fell); *Passive Movements of newly-formed Acrogenous Spores in Verticillium*, by Dr. C. J. La Touche (presented by the author); *A Verticillium Disease new to Great Britain*, by Fred. C. Atkins (presented by the author); *The Preparation of Pure-Culture Mushroom Spawn from Spores*, by Dr. E. B. Lambert; *Some Common Mushrooms and How to Know Them*, by Dr. Vera K. Charles; *Mushroom Diseases Leaflets 2 (Truffle) and 3 (Mycogone)*, by Fred. C. Atkins and Dr. C. J. La Touche; *Preparing for Mushrooms*, by Lt.-Col. W. E. Shewell-Cooper (in *The Field*); *Verbatim Reports of Speeches at Second Annual Luncheon and Meeting*; *M.G.A. Bulletin 11*; *M.G.A. Bulletin 12*; *M.G.A. Bulletins 6-9 inclusive (bound edition)*; *Official List of Available Publications of the U.S. Department of Agriculture*.

Fred. C. Atkins lodges a Complaint

VERDI GRIS (?) IN WORTHING

CONSIDERABLE LOSSES IN PRODUCTION HAVE BEEN REPORTED FROM THE WEST SUSSEX AREA RECENTLY DUE, IT IS SAID, TO VERDI GRIS. What on earth is Verdi Gris? According to my dictionary it is "a basic acetate of copper, the greenish rust of copper, brass or bronze." When I was in Worthing recently I brought away with me samples of this Verdi Gris. It was, of course, a fungus, tentatively identified by several workers as a *Sporotrichum* and known in the United States as "mat disease."

Verdi Gris—no, let us call it mat disease, rather than this!—appears between the casing soil and the compost. Its mycelium is first whitish and then light yellow to very light brown. In its early stages it is believed to reduce the crop and cause pinheads to die (another cause of dying pinheads!); later, it is said, cropping ceases entirely. The matting of its mycelium apparently forms a barrier between compost and casing.

Americans regard mat disease as "potentially serious," though reports vary from "no widespread loss" to "considerable damage done." Advice ranges from "Never use exceptionally strawy manure that has been subject to a cold, musty, sour fermentation" to "A peak heat of 135° F. is generally satisfactory in preventing its development." The first advice is a little obvious; the second is valueless to the glasshouse growers in West Sussex.

I cannot help disliking the loose terminology so widespread in the Mushroom Industry. In France and Germany, according to Borzini, contamination due to *Chaetomium*, *Penicillium*, *Aspergillus*, *Trichoderma* or *Myceliophthora* spp. is broadly referred to as "Plart verte" and "Vert de Gris." Hitherto, in this country, we have used the general term "Green mould." Why now start to confuse things more deeply by calling this yellow mould which has come into the news "Verdi Gris"? It's monstrous!

SHOCK FOR THE GROWER

I cannot forbear having another crack at *The Smallholder*! You know it sometimes happens that a bed suddenly ceases to bear, for no apparent reason. The explanation, according to this journal, is that "in some way or another the bed has received a check" and the way to overcome it is to "give it another by watering with ice-cold water at the rate of one gallon per square yard." This treatment, it is claimed, "restores full cropping." I pass this on because it will be of immense comfort to those of us who have hitherto imagined there might be other causes such as *Fusarium*, *Truffle* and *Mat Disease*.



FRED. C. ATKINS.

PRESS CUTTINGS

The Mushroom Growers' Bulletin contains a Mutual Aid feature of questions and answers of interest to all mushroom growers.

The Gardeners' Chronicle, 24.4.48.

The average weekly earnings of men in Industry (not Agriculture) in October, 1947, were £6.8.1., an increase of 86% over those ruling ten years ago.

Ministry of Labour Gazette, May, 1948.

(Editorial comment: the Agricultural Workers' Union is now asking for a £6 a week minimum).

In all truthfulness I think I can say that there is no organisation of which I am a member that is more "on the spot" than the Mushroom Growers' Association. This organisation runs an excellent magazine and offers a splendid service to its members.

Lt.-Col. W. E. SHEWELL-COOPER, *The Field*, 27.12.47.

Having gone carefully into the costings, yield and market returns for spring crops of mushrooms under glass, some of us consider that the margin of safety is too narrow and that we must rely on our autumn beds, so far as glass is concerned, and devote the houses in the spring to safer crops involving less risk in the outlay. At present production costs, we find that a pound-and-a-half a square foot is about the minimum yield of mushrooms to give us a comparable profit with cucumbers or beans.

West Sussex Correspondent, *The Grower*, 1.5.48.

Promising results have been obtained by Col. E. Noel in the tray-growing of mushrooms in the glasshouses at his St. Mary Cray, Kent, nursery. For this purpose he has purchased thousands of ex-W.D. ammunition boxes and devised his own system of stacking and cropping. When all glasshouse space became occupied, Col. Noel experimented by transporting a large quantity of trays to caves at Godstone, Surrey, many hundreds of feet below ground. The method proved cheaper than glasshouse production owing to lack of fuel costs but, on the other hand, transport charges were heavy. One serious setback also marked the initial experiment, when some hundreds of boxes were lost through Rose Comb infection. It was found that the caves had been used for wine storage during the war and, in spite of preliminary sterilization and burning, sufficient spores remained to ruin the crop. Alternative accommodation has now been found.

The Fruit Grower, 4.3.48.

DO YOU KNOW?

That in Great Britain we have over 5,000 species of fungus, a number which exceeds that of our flowering plants, ferns, mosses, hepaticas, algae and lichens all added together?

A Mushroom Grower's Diary

26th March—My Automatic Stoker has been working for two weeks and I estimate the saving so far to be between 15 cwt. and 1 ton of fuel. Thermostatic control is largely responsible. The boiler has been "off" during every one of these last warmish days (except for its hourly "kindling") whereas by hand firing coke would have been burning pretty hard all the time.

27th March—One hears much these days of the heat up after filling, but little of the peak heat fumigation that was once an essential part of the process.

30th March—To my horror I've found Truffle breaking out in no less than 4 places in a 2nd flush. This augurs badly, coming at the beginning of the warm season. I shall mark out the areas and keep them dry for the rest of the crop. I don't feel like removing the affected parts for fear of spreading the mycelium, which would grow quickly if it settled on any watered part of the beds.

31st March—A local attack of Spring-tails. Held the hot end of an electric light bulb on to an affected mushroom cap; only a few springtails sprang off.

1st April—Cecid larvae are playing havoc with one house after 3rd flush. The stems of almost all mushrooms are covered with them. They cause a sort of weakening of growth which can't stand watering. Thus if the mushrooms even see the hose pipe they turn brown.

9th April—To illustrate a point I've often made—that the ideas and plans one has to-day are forgotten by to-morrow—I've heard that a grower who asked a question in our Mutual Aid Section found himself answering it in a later issue—he had not recognised his own problem!

16th April—I read in an otherwise excellent little book on gardening—"after pulling the mushrooms fill the cavities made with compost."

2nd May—Disease at the double! On top of a very fine flush of Truffle, beautifully developed, I have an increasing growth of Dactylium. If the Truffle becomes contaminated with Verticillium, and Bubble develops in the Dactylium, I may claim to have a very decent collection.

12th May—Cecid larvæ mentioned earlier have now assumed gigantic proportions. Two more houses are so badly affected after 3 flushes that every mushroom grown is unsaleable. I'm told a cure is a triple dose of D.D.T. This I shall try. Gammexane, I've found has little or no effect. I now learn Cecid larvæ are increased by the process known as Pædogenesis—increase by division. Geometric progression would therefore account for the alarming rate of spread.

14th May—I have seen a sample of the new Swedish insulation board made of straw. Standard thickness is 2", 4" wide and 8', 9", or 10' long. The highly compressed straw is sandwiched between Kraft "Skins" but it is the compression that gives the board its strength. It is claimed to be vermin proof and has a thermal conductivity of 0.6. It compares favourably (as an insulator) with brick and timber but is not as good as corrugated foil, expanded ebonite (Onazote), slag wool, fibre board, cork, etc. Its name is "Stramit." Details and interesting brochure obtainable from Lloyd Boards Ltd., 15 Portman Street, London, W.1.

19th May—The British Railways, I hear, are to dispose of all their horses in favour of mechanical transport. This is a serious affair for many growers who depend directly or indirectly on that manure source. It looks as though those who won't support Research on Synthetic Composts—and everybody has been asked several times—will soon find themselves in a most precarious position. They've only themselves to blame. Even in mushrooms one should look to the future.

20th May—Saw on a Midland farm to-day, and for the first time, the alleged depredations of the eelworm. This worm is responsible, I was told, for the vanishing of spawn growth from compost. "Where this worm is, growth has vanished." Samples of compost taken from affected spots showed a good worm content under the microscope. I asked to see sample of compost from an area where the spawn growth was full and healthy-looking. I found the same worm content. It was argued that that area would therefore vanish too. But I wonder. Was the worm the only source of the trouble?

24th May—At a County N.F.U. Committee Meeting:—"There's Mr. X, for instance, growing mushrooms. An easy, simple, half-time, lady's job. Can't we make him do some work?" When I, who happen to be Mr. X, heard of this, I invited the offender to see how easy (!) mushrooms are to grow. After 1½ hours of intensive inspection and education, he went away a humbled man and asserted that he had never worked as hard in his life as he saw I had to. Verb. sap.

25th May—I have been pleased to read what appears to be a confirmation from an authoritative source that the damage on a Midland farm, mentioned before, was in all probability not caused by eelworms.

26th May—A heavy dose of Murfume D.D.T. Smoke (2 size 15 to a 2,000 sq. ft. house) seems to have accounted for a bad attack of Cecid larvæ.

2nd June—2·3 per sq. ft. in 34 days on Concrete beds. So runs my No. 8

to-day. I've no doubt the crop will go on a little longer—at any rate there are 5 weeks in hand. Yet this morning I hear that America is 100 years ahead of us. Probably they can guarantee 2·3 in 34 days. Like the gambler, I do not advertise the failures running concurrently with No. 8!! But who said concrete was no good?

3rd June—An application (made in February) to erect 3 Handcraft Huts was refused by the Ministry of Works, despite A.E.C. backing. I appealed. Appeal refused. Both refused on grounds that there was no building labour available in my district. I know labour is available and I offered to do 60% of work with my own labour. I was told when I visited them that if I brought my application down to below £500 they would reconsider it. "Then where," I asked, "does the labour come from?" No answer. I applied again for 1 house only and to-day it has been refused. Is this obstructionist policy really necessary?

GROWERS!

MAY WE REMIND YOU OF YOUR LIABILITY AT COMMON LAW TO EMPLOYEES?

* * *

On the 5th July the State assumes responsibility for Workmen's Compensation; but the grower is reminded that the workman has the option of claiming against him at common law, if he thinks that his injury was caused through the negligence of his employer. The defence of "common employment" will no longer be available.

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A half-crown 12-page leaflet on “The Major Diseases of the Cultivated Mushroom” is to be published shortly by Fred. C. Atkins and C. J. La Touche, composed for the most part of reprints of papers they have contributed to the M.G.A. Bulletin.

The diseases dealt with are Cobweb, Bubble, Brown Spot, the two Verticilliums, Bacterial Blotch and Bacterial Pit. Lavishly illustrated, there are concise notes on characteristics, original source of infection, prevention, control and scientific description.

The authors hope to follow this booklet next year with another dealing with “Major Competitors of the Cultivated Msuhroom,” containing similarly-illustrated notes on Truffle, White and Brown Plaster Moulds, Xylaria and Mat Disease. The remainder of the known mushroom troubles, it is contemplated, will eventually be dealt with in “Minor Diseases and Competitors of the Cultivated Mushroom.”

Commercial growers, as well as plant pathologists and advisors, have long felt and expressed the need for such notes, and one often wonders why they have not appeared before now. The authors give these answers: “The demand may be great among a small group of growers, but our experience in the publication of shilling leaflets on specific diseases suggests it is not general. If, as we find, the demand is limited to a couple of dozen, it is not an economic proposition to publish. In no case has the demand so far paid for the photographs, much less the block making, the typesetting, the artist’s fees and the time taken in compilation.”

Mr. Atkins adds: “The available literature is for the most part based on inconclusive research, and exhibits a tendency to copy slavishly anything written earlier. All Dr. La Touche and I have done is to assemble from this literature and to collate what is widely accepted in the light of present knowledge. Despite our keenness to execute this task we have ourselves been deterred by the obvious inaccuracy of much we have read—and particularly has this been noticeable when we have given more than superficial attention to a disease. These notes are no more than digests of facts as they appear to-day in the light of present knowledge. The photographs and diagrams are nearly all original, and the need for photographs has held up publication for several months. The appearance of the two other booklets will have to await the appearance of photographs of Mat Disease, for example—and we hope growers will co-operate by submitting to us any they possess.”

THIRD ANNUAL LUNCHEON

Mr. C. E. Hudson, Senior Education and Advisory Officer to the Ministry of Agriculture, has consented to be the Guest of Honour at the Third M.G.A. Annual Luncheon, to be held in London, at the end of November.

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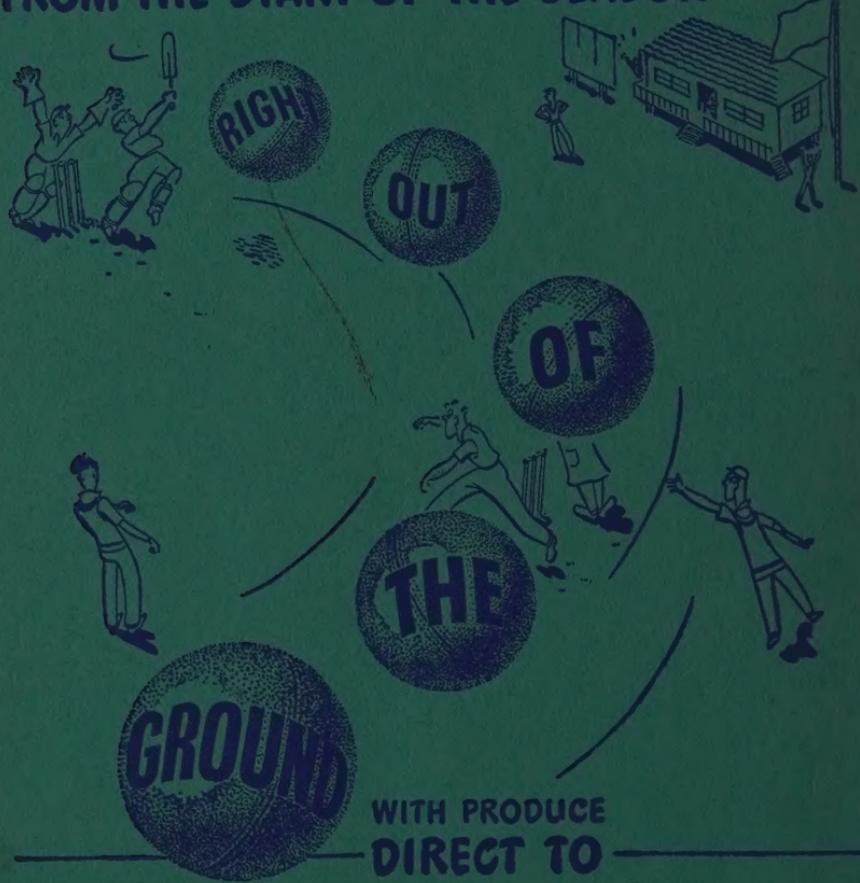
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